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PROCESS AND DEVICE FOR THE MANUFACTURE AND FILLING OF CONTAINERS
[Verfahren und Vorrichtung zum Herstellen und Befüllen von Behältern]

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Specification

[0001]

The present invention relates to a process for the manufacture and filling of containers, with the features of the generic part of Claim 1. Furthermore, the invention relates to an apparatus for carrying out such a process.

[0002]

DE 25 02 170 A1 teaches a generic process and an apparatus for the manufacturing and filling of containers, according to which a hose of plasticized plastic material is extruded into an open mold, during which the hose is welded on its leading end during the closing of the mold in order to form the container bottom. The hose is subsequently separated by a separating element above the mold in order form a filling opening and the mold with the hose with the open filling opening is moved into a filling position in which the container is filled after it has been formed in the mold by producing a pressure gradient that acts on the hose and widens it.

[0003]

In addition, US 6,098,676 A teaches performing the covering of the filling opening of the hose during the movement of the mold into the filling position by a "sterile barrier" by means of a sterile air lock under which the container opening is located during the blowing, filling and closing, in order to protect the interior of the container from contamination by germs or other particles during the movement of the mold into the filling position.

[0004]

Whereas in the known solutions the filling opening is effectively protected by the sterile filling space in the filling position, the open filling opening is not completely protected during the shifting movement of the mold from the extrusion position, in which the formed hose is separated under the extruder nozzle and the filling opening is formed, to the attainment of the filling position, even if the process is carried out in a pure space, and it turned out that even the use of a sterile airlock as sterile barrier does not satisfy the requirements of an especially high freedom from germs.

[0005]

Starting from this state of the art, the invention is based on the problem of indicating a process that that ensures an even better protection of the open fill opening over this state of the art. In a process of the initially cited type this problem is solved in accordance with the invention with the features of the characterizing part of Claim 1.

[0006]

This not only avoids the danger that after the separation of the hose foreign bodies could fall into the open fill opening before the mold has reached the sterile filling space, but also the sterile barrier prevents the access of germs to the filling opening during this process section. The process in accordance with the invention is therefore particularly suitable for the manufacture of highly sensitive products for the application areas of medicine and pharmaceuticals. Furthermore, this brings it about that the plate moves together with the cutting edge separating the hose so that the filling opening is already covered during its formation by the heatable plate, that is, that the filling opening is not without a cover at any time.

[0007]

Especially favorable conditions result here if the separating element is formed from a cutting edge that follows the heatable plate without a distance.

[0008]

An economical course of the process with short cycle times results if the heatable plate with the cutting edge arranged on its leading edge is moved for separating the hose from a retracted base position into a working position in a direction in which the plate is arranged in such a manner above the movement path of the mold leading into the filling position that the filling opening is covered by the plate during its entire path to the filling position, and the plate and the cutting edge are then moved back from the working position into the base position after the mold has attained the filling position.

[0009]

The invention also has as subject matter an apparatus for the manufacture and filling of containers, that has the features of Claim 8.

[0010]

The invention is described in detail in the following using the drawings.

[0011]

Figure 1 shows a schematically simplified representation of an open blow mold and of an extrusion head located at the top for forming a hose of plasticized material.

[0012]

Figure 2 shows the partially closed blow mold of Figure 1 after being moved into a filling position and after the formation of the container to be filled, and

[0013]

Figure 3 to 5 shows perspective views that are schematically greatly simplified for illustrating the course of the process in accordance with the invention.

[0014]

Figure 1 and 2 show parts of an apparatus for manufacturing plastic containers in the blow mold process, in which a hose 3 of fused plastic material is extruded between the two mold halves 5 of a mold 6 shown in Figure 1 in the open state. After the extrusion of hose 3 into the open mold 6, hose 3 is separated between the nozzle exit of the extruder apparatus 1 and the top of mold 6. In Figure 1 the separation line is shown in dots and designated with 8. Figure 2 shows mold 6 in a partially closed state in which the parts shaping the main part of the container 12 to be formed from hose 3, namely, the mold halves 5, are brought together in such a manner that welding edges 7 on the bottom undergo a welding procedure on the bottom end of hose 3 in order to close hose 3 on a bottom welding seam 9 (Figure 2).

[0015]

Figure 2 shows mold 6 in a filling position into which the mold is laterally pushed opposite the position aligned on extruder apparatus 1. This filling position container 12, that was formed previously in that blowing air had been blown in through the open filling opening 15 by a blowing pin (sot shown),

is filled with the filling material via filling opening 15. Figure 2 shows the end of the filling pin 11 introduced for this purpose into filling opening 15. Instead of filling pin 11 and a previously introduced blowing pin, the shaping and filling of the container can also take place by a combined blowing-filling pin.

[0016]

In the filling position shown in Figure 2 the mold is located underneath a so-called sterile filling space (ASR) that is not shown in Figure 2 an that acts as an aseptic screen for filling opening 15 formed by the preceding separating procedure on hose 3 on separating line 8 indicated in Figure 1. After the filling of container 12 filling pin 11 is removed upward and the still open, movable upper welding cheeks 13 of mold 6 are brought together in order to effect the shaping on the container neck and/or to weld the latter at the same time by welding. An outer threading for a screw cap is formed with welding cheeks 13 shown in Figure 1 and 2, which can be additionally provided for closing by welding, for example, in the form of a screw cap with a puncture pin in it.

[0017]

Figure 3 to 5 illustrate in a greatly simplified schematic representation the course of the process in accordance with the invention using an example in which two hoses 3 are simultaneously extruded by extruder apparatus 1 into adjacent hollow mold spaces of the open mold 6 for the simultaneous manufacture of two small-volume containers, see Figure 3, where mold 6 is indicated solely by the contours of the mold halves 5 that can move in the direction indicated by the double arrow 22 for opening and closing the mold.

[0018]

Figure 3 shows the operating state before the separation of the extruded hoses 3, in which a heatable cutting edge 21 serving as separating element and a heatable plate 23, on whose front edge cutting edge 21 is arranged with no distance, are located in their retracted base position. In order to separate hoses 3, plate 23 and cutting edge 21, which can move back and forth in the direction indicated by double arrow 25, are moved out of the base position of Figure 3 into the working position, see Figure 4.

[0019]

Heatable plate 23, whose surface consists of stainless steel, comprises a heating apparatus embedded in it (not shown), whose activity can be controlled by temperature sensors 27. Plate 23 is heated together with cutting edge 21 to a germ-killing temperature that is preferably in the range of 200°C so that plate 23 represents a sterile barrier that is located in the advanced working position above openings 15 of hoses 3, which openings were formed during the separation procedure. In the next step, shown in Figure 4, mold 6 is now shifted in the direction of the double arrow 29 out of the extrusion position (Figure 3) into the filling position shown in Figure 4, during which filling openings 15, which are open at this time, on the surface of mold 6 are located under plate 23 that remained in the advanced working position and are therewith covered by this sterile barrier. Figure 4 shows the operating state in which mold 6 has reached the filling position, where filling openings 15 are now located below a sterile filling space 31. As can be seen from Figure 4, plate 23 extends so far along the movement path of mold 6, which leads into the filling position, that the entire range of this movement path is covered, i.e., that filling openings 15 do not leave the covered range of plate 23 until they pass in the range of sterile filling space 31.

[0020]

Plate 23 and cutting edge 21 are only moved back from the advanced working position into the base position after attaining this filling position, in which base position cutting edge 21 is located in the start position again for separating the hoses 3 formed in the next extrusion cycle, see Figure 5.

[0021]

The essential particularity of the invention, that the filling openings formed during the separation procedure of the extruded hoses are covered from the moment of their formation until achieving the filling position protected by a sterile filling space 31 by a sterile barrier, is explained above using the example of a heatable plate 23 with a heatable cutting edge 21 present on its front side. It should be mentioned that in principle even the use of a different separating element and of a differently constructed a heatable structural element forming a sterile barrier is possible. Thus, for example, instead of a knife-like cutting edge 21 a heating wire could be provided or instead of plate 23 a heatable, extremely close-meshed grid with openings in the micrometer range could be provided. The process can be used, as is shown in Figure 3-5, for the simultaneous manufacture of several containers, preferably small-volume containers in ampoule form or for the manufacture of containers individually produced from a hose extruded at each work cycle. The forming of the containers can be carried out by blow molds, or in particular in the case of very small-volume containers, by vacuum forming.

Claims

1. A process for the manufacture and filling of containers (12), in which at least one hose (3) of plasticized plastic material is extruded into an open mold (6), the hose (3) is welded on its leading end during the closing of the mold (6) in order to form the container bottom, the hose (3) is separated above the mold (6) in order to form a filling opening (15) by means of a separating element (21), and the mold (6) is moved with the hose (3) comprising the open filling opening (15) into a filling position in which the container (12) is filled after it has been formed by the production of a pressure gradient acting on the hose (3) and widening it in the mold (6), characterized in that the filling of the container (12) takes place under sterile conditions in a sterile space (31), that the filling opening (15) of the hose (3) is covered during the movement of the mold (6) into the filling position by a sterile barrier (23), and that the sterile barrier is formed by a heatable plate (23) that can move together with the separating element (21) separating the hose (3), which plate is heated to a germ-killing temperature, preferably above 150°C.

2. The process according to Claim 1, characterized in that the separating element is formed from a cutting edge (21) that immediately follows the heatable plate (23).

3. The process according to Claim 2, characterized in that the heatable plate (23) is moved with the cutting edge (21) arranged on its leading edge for separating the hose (3) from a retracted base position into a working position in the direction in which the plate (23) is arranged above the movement path of the mold (6) leading into the filling position in such a manner that the filling opening (15) is covered by the plate (23) over its entire path to the filling position, and that plate (13) and cutting edge (21) are then moved back into the base position after the mold (6) has reached the filling position.

4. The process according to one of Claims 1-3, characterized in that the plate (23) is heated to a temperature of more than 170°C, preferably to a temperature in the range of 200°C.

5. The process according to one of Claims 1-4, characterized in that more than one hose (3) of plasticized plastic material are extruded into a multi-partite mold (6) for the simultaneous manufacture of several containers (12), and that the hoses (3) are separated in common by the separating element (21).

6. The process according to one of Claims 1-5, characterized in that a blow mold (6) is used as mold in which the pressure gradient acting on the hose (3) and widening it to the container (12) is produced by the supplying of blowing air.

7. The process according to one of Claims 1-5, characterized in that a mold is used in which the pressure gradient acting on the hose (3) and widening it to the container (12) is brought about by a vacuum produced between the mold walls and the outside of the hose (3).

8. An apparatus for the manufacture and filling of containers (12), with at least one mold (6) comprising movable mold walls (5) into which mold at least one hose (3) of plasticized plastic material can be extruded whose mold parts (5) can be closed in order to weld the leading end of the hose (3) by welding edges (7) located on them in order to form a container bottom, with an apparatus for producing a pressure gradient that acts on the hose (3) and widens it in order to form the container (12) on the mold walls (5), with a movable separating element (21) that can move between a retracted base position (Figure 3) and a working position (Figure 4) in order to form a filling opening (15) by separating the hose (3) above the mold (6), and with a shifting apparatus for moving the mold (6) into a filling position for filling the container (12) through this filling opening (15), characterized in that the filling of the container (12) takes place in a sterile space (31), that a sterile barrier (23) that can move together with the separating element (21) is provided in such a position and with such dimensions that it is located in the working position of the separating element (21) above the movement path of the mold (6) leading

into the filling position and covers the filling opening (15), and that a heatable plate (23) is provided as sterile barrier that can move together with a cutting edge (21) serving as a separating element.

9. The apparatus according to Claim 8, characterized in that the cutting edge (21) can be heated and is arranged along the leading edge of the plate (23) with no distance, and that this plate can move in a direction running obliquely to the movement path out of its retracted base position during the separating of the hose (3) into its working position covering the movement path of the mold (6).

10. The apparatus according to Claim 8 or 9, characterized in that the heatable plate (23) comprises a heating apparatus embedded in it and at least one temperature measuring sensor (27) for controlling the heating apparatus.

11. The apparatus according to Claim 10, characterized in that the heatable plate (23) is constructed in several layers and that at least the layers on its outer wide sides are formed from stainless steel.

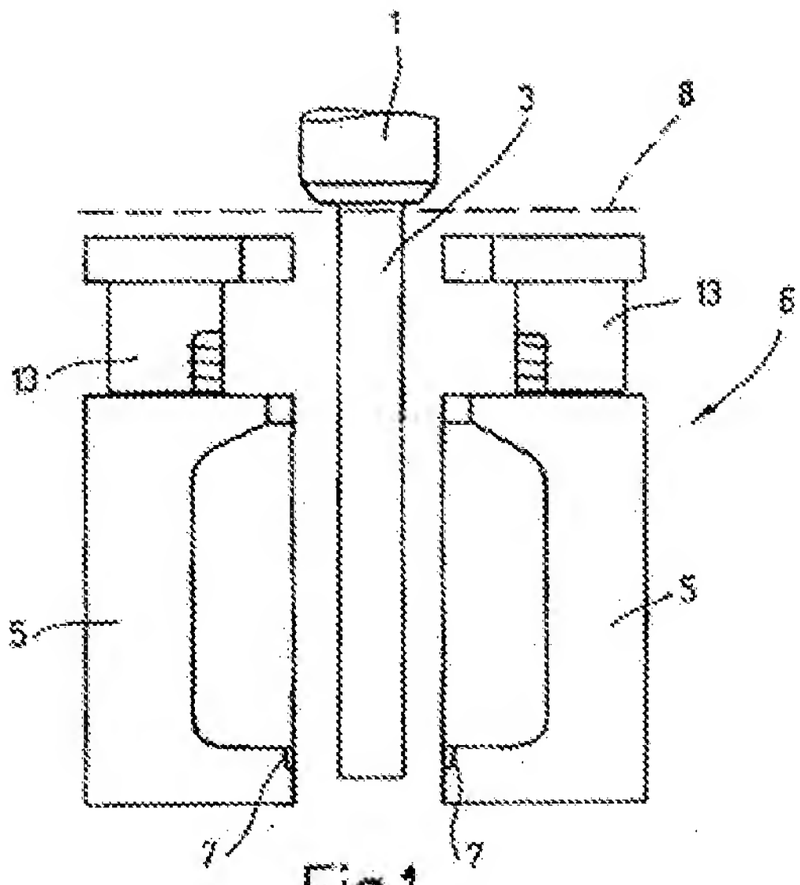

Fig.1

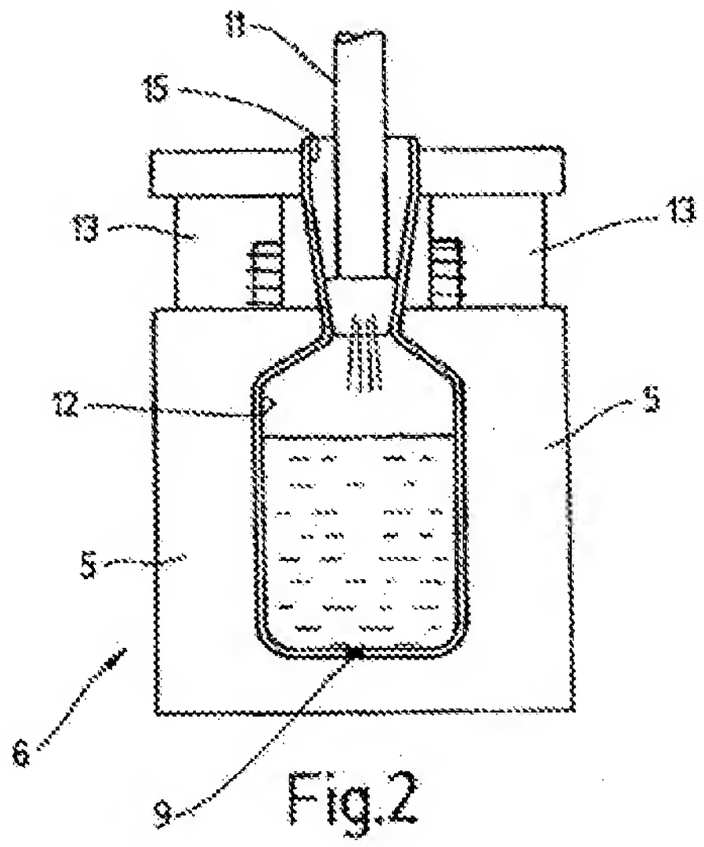

Fig.2

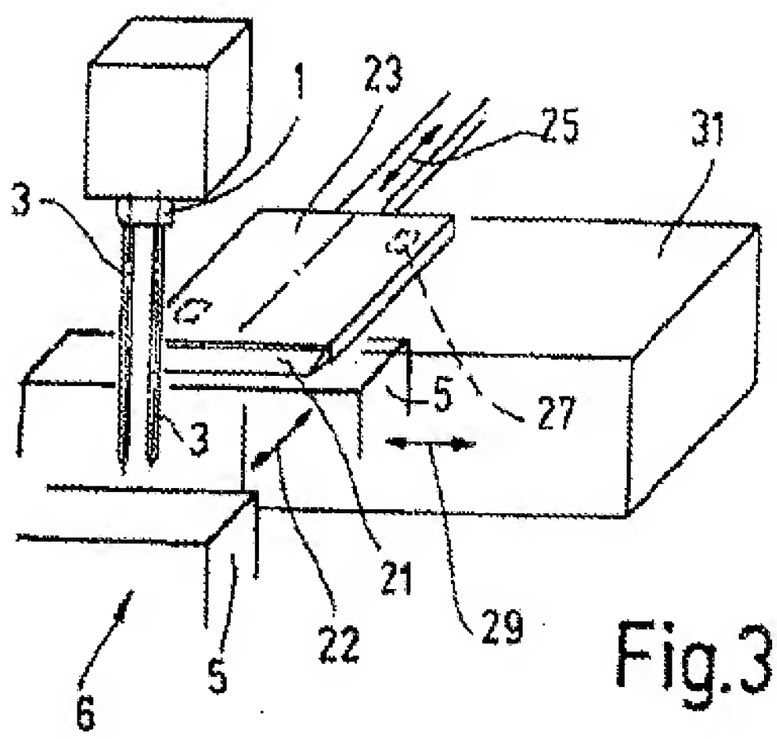

Fig.3

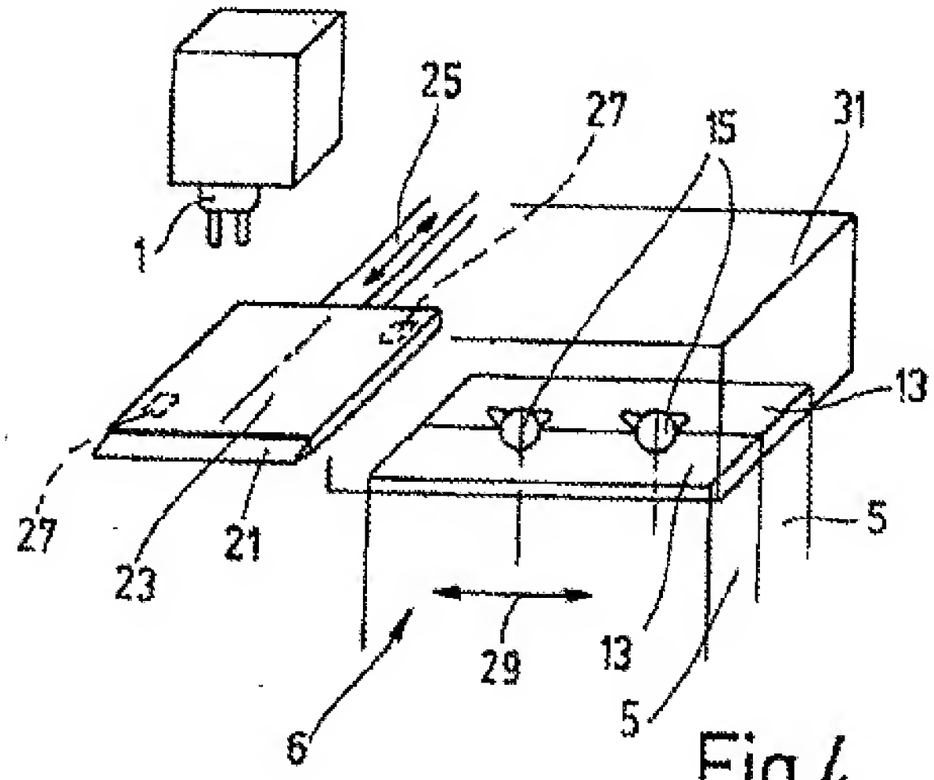

Fig.4

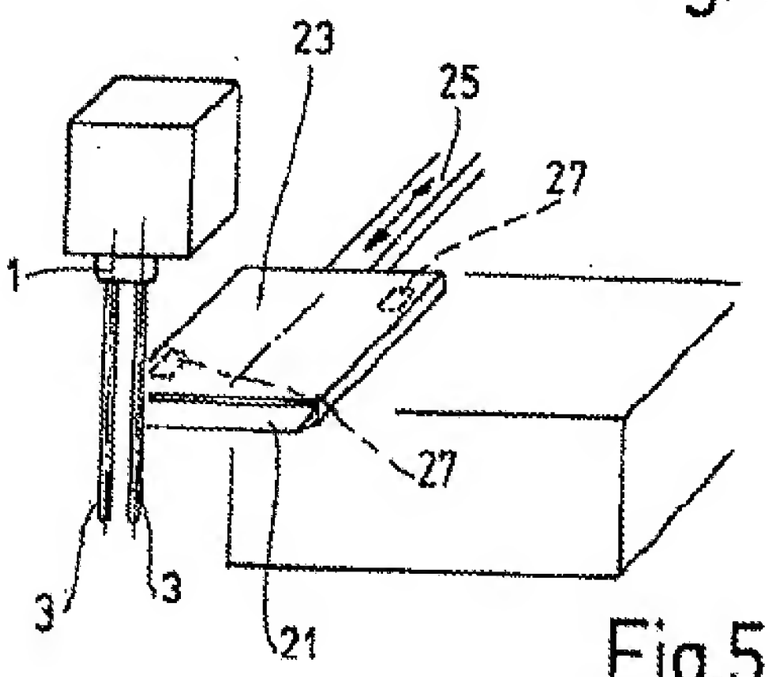

Fig.5